DATA SHEET

TDA1556Q
2 x 22 W stereo BTL differential amplifier with speaker protection and dynamic distortion detector

Product specification
File under Integrated Circuits, IC01

July 1994

Philips
Semiconductors

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FEATURES

- Few peripheral components
- High output power
- Low output offset voltage
- Fixed gain
- Loudspeaker protection (with diagnostic facility)
- Differential inputs
- Dynamic Distortion Detector (DDD)
- High common mode input signal
- Very high CMRR
- Good ripple rejection
- Mute/stand-by switch
- Load dump protection
- Short-circuit safe
- Thermally protected
- Reverse polarity safe
- High energy handling capability at the outputs (V_P = 0 V)
- Electrostatic discharge protection
- No switch-on/switch-off plop
- Flexible leads
- Low thermal resistance

GENERAL DESCRIPTION

TDA1556Q is a monolithic integrated class-B output amplifier containing two 22 Watt amplifiers in a BTL configuration. The device is contained in a 17-lead single-in-line (SIL) plastic power package. It has two differential inputs and is primarily intended for car booster applications.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITION	MIN.	TYP.	MAX.	UNIT
V_P	positive supply voltage					
		operating	6.0	14.4	18	V
		non-operating	–	–	30	V
		load dump	–	–	45	V
I_{ORM}	repetitive peak output current		–	–	4	A
I_P	total quiescent current		–	80	–	mA
I_{sb}	stand-by current		–	0.1	100	μA
I_{sw}	switch-on current		–	–	60	μA
$\|Z_i\|$	input impedance		50	–	–	kΩ
T_{vj}	virtual junction temperature		–	–	150	°C
P_O	output power	4 Ω; THD = 10%	–	22	–	W
SVRR	supply voltage ripple rejection	R_S = 0 Ω; f = 100 Hz to 10 kHz	48	–	–	dB
V_{os}	DC output offset voltage		–	–	100	mV
α	channel separation		40	–	–	dB
ΔG_v	channel unbalance		–	–	1	dB
CMRR	rejection ratio		–	72	–	dB

ORDERING INFORMATION

EXTENDED TYPE NUMBER	PACKAGE			
	PINS	PIN POSITION	MATERIAL	CODE
TDA1556Q[(1)]	17	SIL	plastic	SOT243R

Note

1. SOT243-1; 1996 August 19.

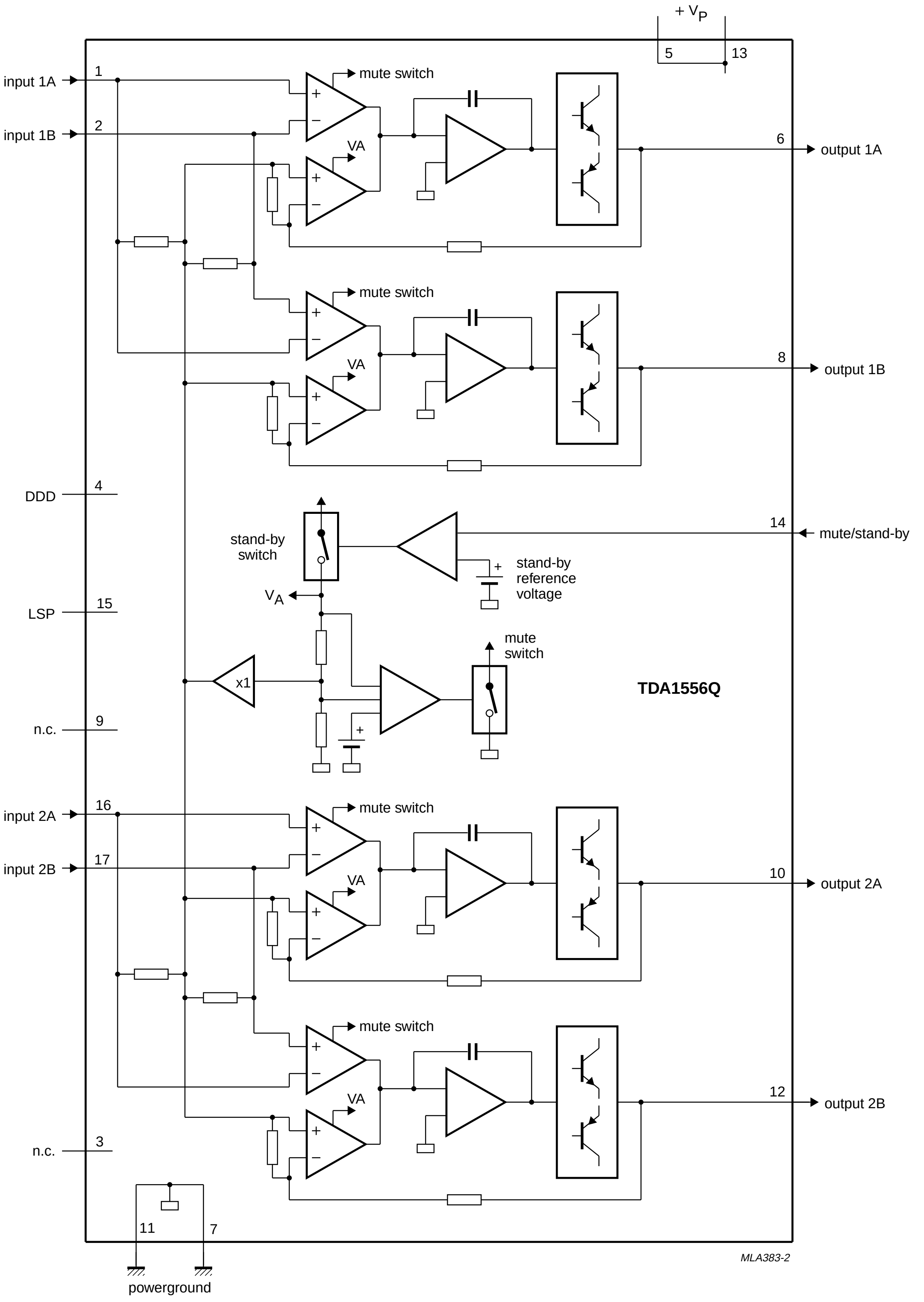


Fig.1 Block diagram.

PINNING

SYMBOL	PIN	DESCRIPTION
IN1A	1	input signal 1A
IN1B	2	input signal 1B
n.c.	3	not connected
DDD	4	dynamic distortion detector
V_{p1}	5	positive supply voltage 1
OUT1A	6	output signal 1A
GND1	7	power ground 1
OUT1B	8	output signal 1B
n.c.	9	not connected
OUT2A	10	output signal 2A
GND2	11	power ground 2
OUT2B	12	output signal 2B
V_{P2}	13	positive supply voltage 2
M/SB	14	mute/stand-by switch
LSP	15	loudspeaker protection
IN2A	16	input signal 2B
IN2B	17	input signal 2A

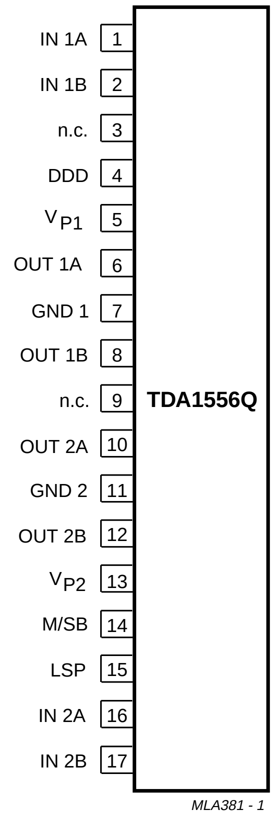


Fig.2 Pin configuration.

THERMAL RESISTANCE

SYMBOL	PARAMETER	THERMAL RESISTANCE
$R_{th\ j\text{-}a}$	from junction to ambient in free air	40 K/W
$R_{th\ j\text{-}c}$	from junction to case (see Figs 3 and 4)	1.5 K/W

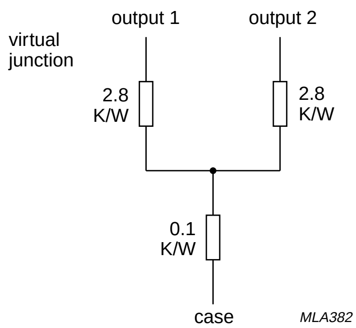


Fig.3 Thermal resistance.

FUNCTIONAL DESCRIPTION

The TDA1556Q contains two identical amplifiers each with a fixed gain of 26 dB and differential input stages.
The device can be used for bridge-tied-load applications.
The circuit has the following features:

- low stand-by current (< 100 μA)
- low mute/stand-by switching current (low cost supply switch)
- mute facility

Loudspeaker protection

Should a short circuit to ground occur, thereby forcing a DC voltage ≥ 1 V across the loudspeaker, a built-in protection circuit is activated to limit the DC voltage across the speaker to ≤ 1 V. The delay time of the protection circuit can be influenced by the external capacitor connected to pin 15.

A dynamic distortion detector (DDD) is activated when clipping occurs at one or both output stages. Its information may be used to operate a sound processor or DC volume control to attenuate the input signal, thereby minimizing the distortion.

LIMITING VALUES

In accordance with the absolute maximum system (IEC 134)

SYMBOL	PARAMETER	CONDITION	MIN.	MAX.	UNIT
V_P	positive supply voltage				
		operating	–	18	V
		non-operating	–	30	V
		during 50 ms (load dump protection); rise time ≥ 2.5 ms	–	45	V
I_{OSM}	non-repetitive peak output current		–	6	A
I_{ORM}	repetitive peak output current		–	4	A
T_{stg}	storage temperature range		–55	+150	°C
T_{vj}	virtual junction temperature		–	+150	°C
V_{psc}	AC and DC short-circuit safe voltage		–	18	V
	energy handling capability at outputs	$V_P = 0$	–	200	mJ
V_{pr}	reverse polarity		–	6	V
P_{tot}	total power dissipation		–	60	W

DC CHARACTERISTICS

$V_P = 14.4$ V; $T_{amb} = 25$ °C; unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Supply						
V_P	positive supply voltage	note 1	6.0	14.4	18	V
I_P	quiescent current		–	80	160	mA
V_O	DC output voltage	note 2	–	6.9	–	V
V_{os}	DC output offset voltage	operating	–	–	100	mV
Mute/stand-by						
V_{ON}	switch-on voltage level		8.5	–	–	V

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
MUTE CONDITION						
V_{mute}	mute voltage		3.3	–	6.4	V
V_O	output signal in mute position	$V_{I\,max}$ = 1 V; f = 1 kHz	–	–	2	mV
V_{os}	DC output offset voltage		–	–	100	mV
STANDBY CONDITION						
V_{sb}	stand-by voltage		0	–	2	V
I_{sb}	DC standby current	V_{14} < 0.5 V 0.5 V ≤ V_{14} ≤ 2.0 V	– –	– –	100 500	μA μA
I_{sw}	switch-on current		–	25	60	μA
I_{PSC}	supply current	short-circuit to ground; note 3	–	10	-	mA
Loudspeaker protection						
$\lvert\Delta V_{6\text{-}8,\,10\text{-}12}\rvert$	DC voltage across R_L		–	–	1.0	V
t_d	delay time		–	0.5	–	s
Protection active ($\lvert\Delta V_{4\text{-}6}\rvert$ or $\lvert\Delta V_{7\text{-}9}\rvert$ ≤ 1.0 V						
I_{15}	current information		–	25	–	μA
V_{15}	voltage information		3.6	–	–	V
Protection inactive ($\lvert\Delta V_{6\text{-}8}\rvert$ and $\lvert\Delta V_{10\text{-}12}\rvert$ ≤ 0.1 V)						
V_{15}	voltage information		–	–	0.3	V

Notes to the characteristics

1. The circuit is DC adjusted at V_P = 6 to 18 V and AC operating at V_P = 8.5 to 18 V
2. At 18 V < V_P < 30 V the DC output voltage ≤ $V_P/2$
3. Conditions: V_{14} = 0 V; short circuit to ground; switch V_{14} to MUTE or ON condition, rise time at V_{14} = ≥ 10 μs
4. Frequency response externally fixed
5. Ripple rejection measured at the output with a source-impedance of 0 Ω (maximum ripple amplitude of 2 V) and a frequency between 100 Hz and 10 kHz
6. Mismatching is given by the following equation:

$$|\Delta Z_i| = \frac{Z_{i1} - Z_{i2}}{Z_{i1}} \times 100\%$$

$$|\Delta Z_i| = \frac{Z_{i3} - Z_{i4}}{Z_{i3}} \times 100\%$$

7. Noise measured in a bandwidth of 20 Hz to 20 kHz
8. Noise output voltage independent of R_S (V_I = 0 V)
9. Common mode rejection ratio measured at the output with both inputs tied together. $V_{I(RMS)}$ < 3.5 V; f = 100 Hz - 10 kHz

AC CHARACTERISTICS

V_p = 14.4 V; R_L = 4 Ω; f = 1 kHz; T_{amb} = 25 °C; unless otherwise specified

SYMBOL	PARAMETER	CONDITION	MIN.	TYP.	MAX.	UNIT
P_O	output power	THD = 0.5%	15	17	–	W
		THD = 10%	20	22	–	W
		THD = 0.5%; V_P = 13.2 V	–	12	–	W
		THD = 10%; V_P = 13.2 V	–	17	–	W
THD	total harmonic distortion	P_O = 1 W	–	0.1	–	%
B	power bandwidth	THD = 0.5%; P_O = –1 dB; with respect to 15 W	–	20 to 15000	–	Hz
f_l	low frequency roll-off	–1 dB; note 4	–	25	–	Hz
f_h	high frequency roll-off	–1 dB	20	–	–	kHz
G_v	closed loop voltage gain		25	26	27	dB
SVRR	supply voltage ripple rejection	note 5				
		ON condition	48	–	–	dB
		MUTE condition	48	–	–	dB
		stand-by condition	80	–	–	dB
$\|Z_i\|$	input impedance		100	120	150	kΩ
$\|\Delta Z_i\|$	input impedance	note 6	–	4	–	%
V_{no}	noise output voltage	ON: R_s = 0 Ω; note 7	–	70	120	μV
		ON: R_s = 10 kΩ; note 7	–	100	–	μV
		MUTE: R_s = 10 kΩ; notes 7 and 8	–	60	–	μV
α	channel separation	R_s = 10 kΩ	40	–	–	dB
ΔG_v	channel unbalance		–	–	1	dB
CMRR	common mode rejection ratio	note 9	64	72	–	dB
THD	total harmonic distortion	I_{DDD} = 50 μA (peak)	–	3.5	–	%

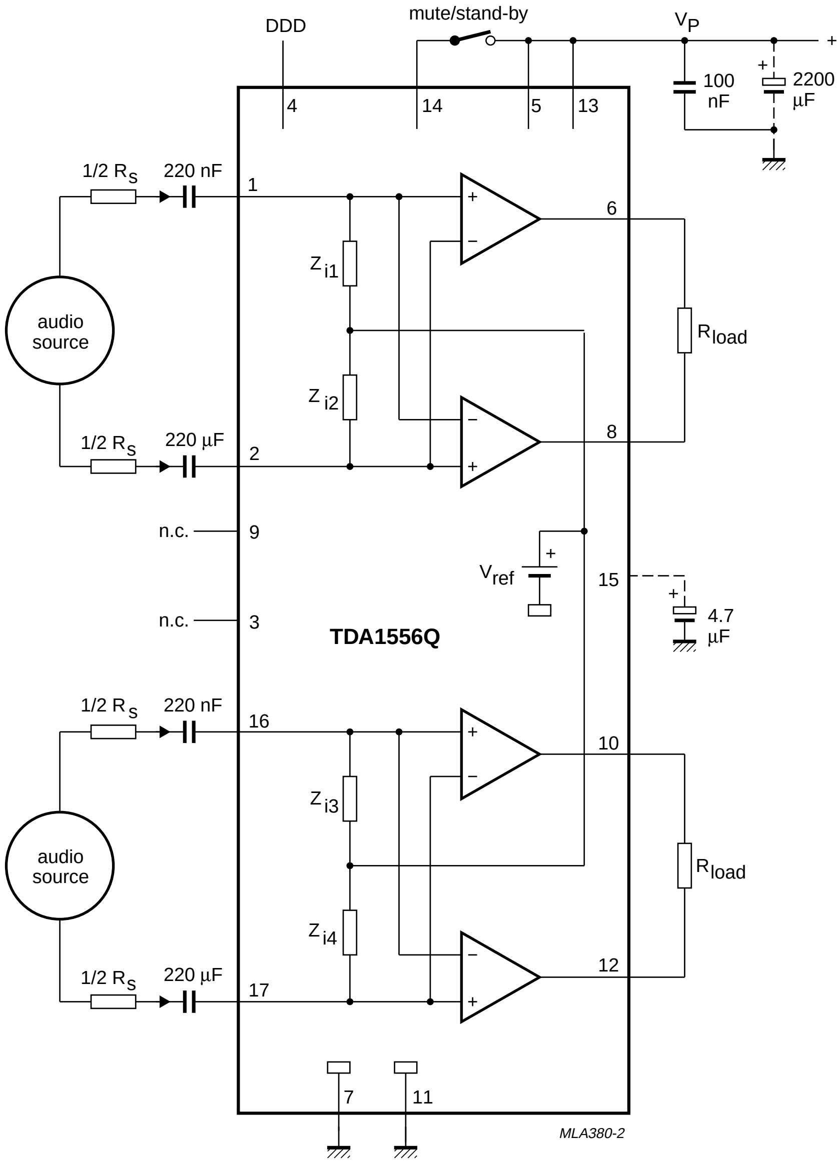
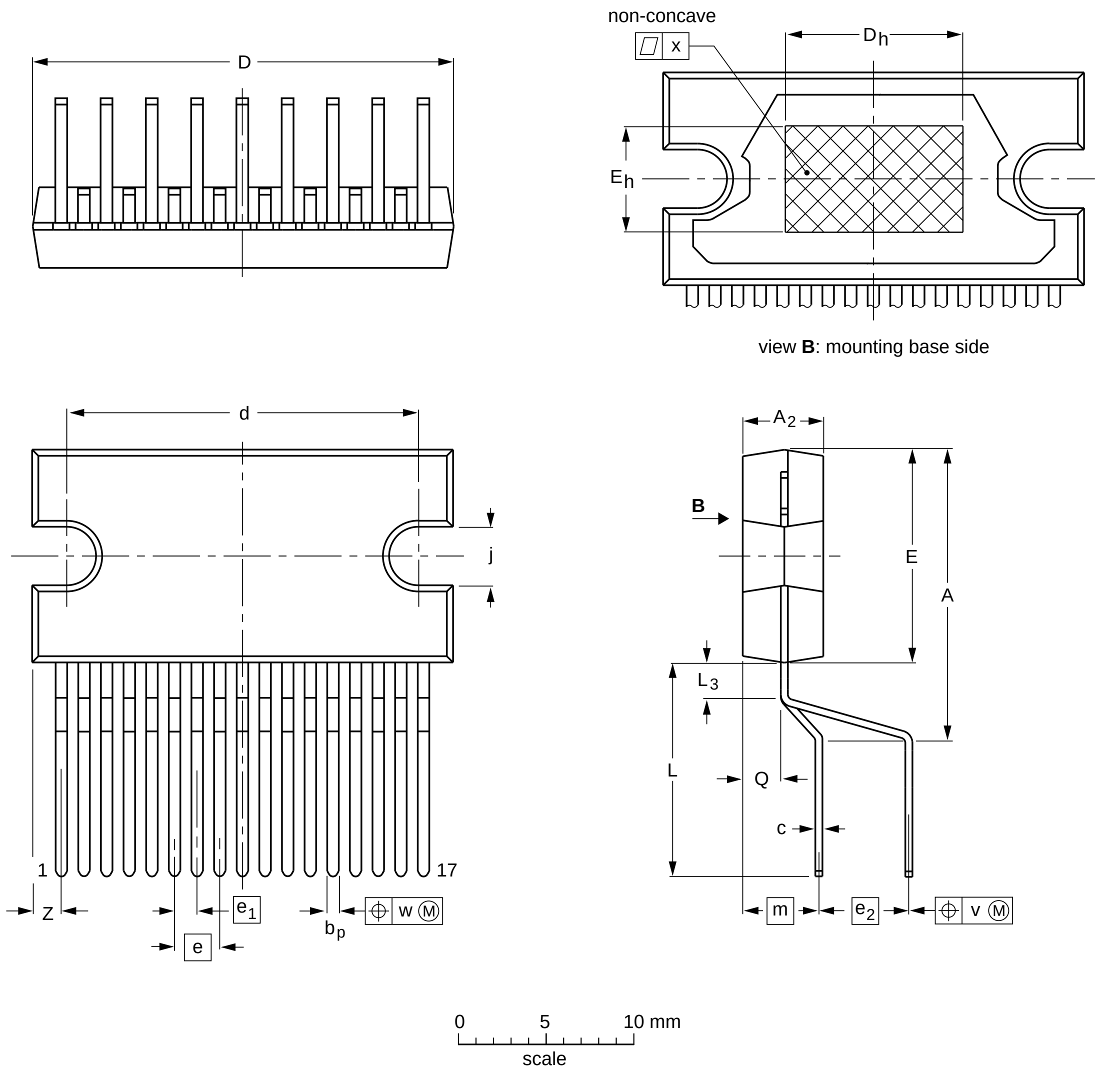


Fig.4 Stereo BTL test diagram.

PACKAGE OUTLINE

DBS17P: plastic DIL-bent-SIL power package; 17 leads (lead length 12 mm) **SOT243-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_2	b_p	c	D(1)	d	D_h	E(1)	e	e_1	e_2	E_h	j	L	L_3	m	Q	v	w	x	Z(1)
mm	17.0 15.5	4.6 4.2	0.75 0.60	0.48 0.38	24.0 23.6	20.0 19.6	10	12.2 11.8	2.54	1.27	5.08	6	3.4 3.1	12.4 11.0	2.4 1.6	4.3	2.1 1.8	0.8	0.4	0.03	2.00 1.45

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT243-1						~~92-11-17~~ 95-03-11

SOLDERING

Introduction

There is no soldering method that is ideal for all IC packages. Wave soldering is often preferred when through-hole and surface mounted components are mixed on one printed-circuit board. However, wave soldering is not always suitable for surface mounted ICs, or for printed-circuits with high population densities. In these situations reflow soldering is often used.

This text gives a very brief insight to a complex technology. A more in-depth account of soldering ICs can be found in our *"IC Package Databook"* (order code 9398 652 90011).

Soldering by dipping or by wave

The maximum permissible temperature of the solder is 260 °C; solder at this temperature must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.

The device may be mounted up to the seating plane, but the temperature of the plastic body must not exceed the specified maximum storage temperature ($T_{stg\ max}$). If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature within the permissible limit.

Repairing soldered joints

Apply a low voltage soldering iron (less than 24 V) to the lead(s) of the package, below the seating plane or not more than 2 mm above it. If the temperature of the soldering iron bit is less than 300 °C it may remain in contact for up to 10 seconds. If the bit temperature is between 300 and 400 °C, contact may be up to 5 seconds.

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

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